

Appendix J: Stowage of Hazardous And Other Special Materials

Hazardous Liquids

Certain materials with inherent hazardous or other unique properties require special stowage facilities and handling precautions, as described in the following paragraphs.

Acid

Liquid acid will be stowed in an acid locker or other designated storage location. An acid locker is a leak-proof, lead-lined box, chest, or locker especially designed for stowing bottles or carboys of acid. Acid lockers will be kept in the Flammable Liquids storeroom; however, acid lockers that contain only medical acids may be kept in a medical storeroom. Corrosive acids are acute fire hazards and therefore should be stowed separately from oxidizing or flammable materials. Corrosive acids or vapors must not be allowed to come in contact with the skin or eyes. Personnel required to handle such material will wear rubber gloves, rubber aprons, and goggles (as necessary) to protect themselves and their clothing from acid burns.

Alcohol

Since most commonly used alcohols have a flash point below 100 degrees Fahrenheit, all alcohol will be stowed in the Flammable Liquids storeroom. Not all alcohol is readily identifiable by name. For example, many lacquer thinners have methanol (wood alcohol), which is extremely poisonous, as the principal ingredient.

Oxidizing Material

Many shipboard fires with resultant fatalities have been attributed to improper stowage or handling of oxidizing materials, particularly calcium hypochlorite. Nitric acid, a strong oxidizer, will be stowed in the acid locker (see paragraph 12.6.1). Oxygen and chlorine gases will be stowed in the same manner as calcium hypochlorite (discussed below). All other oxidizers will be stowed in a dry compartment, away from combustible materials. Calcium hypochlorite is a bleaching agent and disinfectant. On board the vessel it is used for the purification of potable water, sewage treatment and biological and chemical agent decontamination. Calcium hypochlorite itself is noncombustible; however, it is a strong oxidizing agent that will

generate heat, liberate chlorine, and cause fire when stowed in contact with paints, oils, greases, detergents, acids, alkalines, antifreeze, fabrics and other organic and combustible materials. Calcium hypochlorite will normally be segregated and stored in a locked bin or locker with appropriate labeling. Bins or lockers should be located at least five (5) feet away from any heat source or surface that may exceed 140 degrees Fahrenheit, and are not subject to condensation or water accumulation. The area shall not be used to store paints, oils, greases, or combustible organic materials. Calcium hypochlorite should never be stored in any machinery space. Spills or contaminated calcium hypochlorite may be disposed of into water, flushed to the drain, or to the bilge. There is no fire hazard from dissolved calcium hypochlorite even in an oily bilge. Sweepings should be dumped immediately into the water (never in a trash can), and the broom or brush rinsed immediately. Sweepings must not be carried dry for disposal because the dust is dangerous in shipboard drafts. Calcium hypochlorite should not be used as laundry bleach. Organic chlorine laundry bleach is available for shipboard use. While less hazardous than calcium hypochlorite, under conditions of high heat and humidity it can emit fumes that could be hazardous to personnel. Store this bleach in a cool, dry place as far away as possible from conditions of high heat and humidity.

Compressed Gases

Compressed gases must be stowed on the weather deck, unless the vessel has below deck stowage spaces specifically designed for such material. Compressed gas cylinders will be stowed vertically and securely (with valve protection caps in place), away from other flammable materials (especially grease and oil). When compressed gases are stowed on the weather deck, the cylinders will be protected from direct rays of the sun, or accumulation of snow and ice. When compressed gases are stowed below deck, any leaking fumes must be prevented from entering ventilation air-intakes leading to working or living spaces. Since there is usually some gas remaining in most cylinders considered to be empty, "empty" cylinders will be stowed and handled with the same precautions as full cylinders. Compressed gases, particularly the flammable and explosive gases, must be handled with extreme care. Some



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general rules for handling compressed gas cylinders are:

1. Take every precaution to prevent cylinders from being dropped or forcibly struck against hard surfaces (including other cylinders). Do not tamper with the safety devices in cylinder discharge valves; and when cylinders are not in use, be sure that the valve protection caps are always securely attached. (If the valve of a compressed gas cylinder should be snapped off, the released energy would cause the cylinder to behave as a missile. For example: A cylinder that is pressurized to 2,200 pounds [psi] can travel 2,600 feet in free flight; which in a confined space could be disastrous).
2. Prevent cylinders from coming into contact with fire, sparks, or electrical circuits (an exploded steel cylinder would have the same destructive effect as an exploding bomb).
3. Do not drag or slide cylinders that are to be moved. Secure and move them in appropriately designed hand trucks, or if hand trucks are not available, tilt the cylinders and carefully roll them on the bottom edge.
4. Secure cylinders in a cradle, pallet, or rack when they are loaded or off-loaded with a crane or derrick. Never hoist cylinders with electromagnets, hooks, or lines attached to the valve protection cap.
5. Do not alter or deface the numbers, colors, or other markings on the cylinders; do not add markings without approval of the chief engineer; and do not issue cylinders if their contents cannot be identified.

Acetylene

Acetylene is inherently unstable, and may explode when subjected to heat or shock, or upon contact with chlorine, certain metals (i.e., copper, silver, and mercury). Therefore, acetylene must be stowed separately from oxygen or any other materials with which it forms an explosive compound. The gas must never be allowed to escape into an enclosed area and the cylinders must be protected from flames, sparks, lightning, and static electricity. Testing for suspected leaks should be done with soapy water. In moderate concentrations, acetylene may act as an intoxicant. In higher concentrations, it will cause unconsciousness,

and ultimately asphyxiation. Some grades of acetylene also contain many impurities, therefore breathing of acetylene in any concentration for any length of time must be avoided. Acetylene in cylinders is dissolved in acetone, which has a tendency to flow into the valve if the cylinders are stowed horizontally. For this reason, acetylene must only be stowed and used in an upright position, valve end up. When it is known or suspected that acetylene cylinders have been stowed on their sides, they will not be used until they have been in a vertical position for at least two (2) hours.

Oxygen and Chlorine

Oxygen and chlorine are oxidizing gases that, because they can burn without an external air source, strongly support combustion. (Chlorine is also poisonous). Oxygen and chlorine cylinders must be stowed on the weather deck, or in a separate watertight storeroom that has at least one compartment between it and any space that is used for the stowage of combustibles such as flammable liquids or gases, paint, gasoline, and oil.

Nonflammable Gases

Helium, nitrogen, carbon dioxide, and argon are nonflammable gases which, because of their inert characteristics, may be stowed with flammable or oxidizing gases. However, since these non-flammable gases will not support respiration (a sufficient quantity in a closed space will cause asphyxiation), they must be stored on the weather deck, or in other well-ventilated spaces. The same precautions are appropriate for halocarbon liquids because of their high vapor pressure, lack of odor, and tendency to displace air, causing suffocation. Halocarbon liquids are compounds of carbon containing any of the halogen elements (fluorine, chlorine, bromine, iodine, or astatine - i.e., monochlorodifluoro-methane).

Aerosol Products

Aerosol products are liquids, solutions, or powders suspended in a gas propellant and contained in dispensers equipped with release valves. Containers of aerosol are used for the dispensing of paints, enamels, lacquers, insecticides, silicones, rust preventives, etc. The aerosol propellants may be low



boiling-point halogenated hydrocarbons or other hydrocarbons such as liquified propane or isobutane. Aerosol cylinders will burst if exposed to heat sources in excess of 120 degrees Fahrenheit, and are prone to leakage if subjected to impact. Aerosol products, therefore, should be stowed in the Flammable Liquid storeroom, or in cabinets away from oxidizing materials; and mechanical ventilation will be used, when necessary, to remove accumulated vapors.

Flammable or Combustible Material

Flammable liquids have a flash point of 100 degrees Fahrenheit or below; combustible liquids, greases, and pastes have a flash point of 200 degrees Fahrenheit or below. Items that are flammable and/or combustible include:

- gasoline, oils, kerosene, and other petroleum products
- chemicals
- stencil paints, marking inks, and printer's ink
- solvents, thinners, primers, compounds, varnishes, and lacquers
- alcohol, acetone, ether, and naphtha
- greases and pastes.

Except for drummed petroleum, flammable liquids and other flammable or combustible material will be stowed in the Flammable Liquid storeroom.

The Flammable Liquid storeroom normally will be located at either end of the vessel, below the full load waterline, and will ideally be equipped with an automatic fire alarm and CO₂ system. This storeroom should also have incandescent and explosion proof overhead lights (protected by lamp guards), with the switch outside the compartment; and non-sparking vent fans, with the controllers outside the compartment.

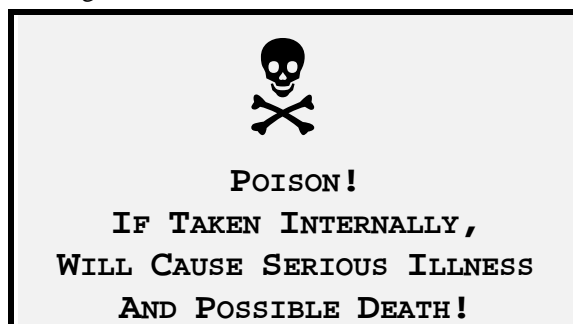
Radioactive Material

Radioactive instruments, electron tubes, and certain other items are labeled with the conventional United

States Nuclear Regulatory Commission (USNRC) radiation symbol, which must not be removed or obliterated. The radiation levels of radioactive material depend upon the type and concentration of isotopes in each unit, and the number of units stowed together. Any area used for stowage of radioactive material (or each bin if there is no designated area) will be conspicuously posted with the standard radiation symbol and the words "**CAUTION - RADIOACTIVE MATERIAL**," and as a minimum, will be monitored when initial or replenishment stocks of radioactive items are being stowed. Rubber gloves and extreme caution will be used in handling damaged or broken radioactive instruments (i.e., electron tubes, etc.), to prevent absorption of dangerous radioactive particles through skin abrasions. Any suspected radiation hazard will be promptly reported to the ship master, the cognizant MARAD marine surveyor, and the medical safety representative (as applicable).

Toxic Substances

A toxic (poisonous) substance may cause discomfort, asphyxiation, and death if ingested/inhaled, or if absorbed through the skin. Therefore, adequate precautions must be taken to prevent such dangers when stowing or issuing toxic materials. Toxic substances will be stowed in a cool, well-ventilated area, separated from acids; and will be protected from fire hazards or impacts which may break seals or damage containers. Each case, carton, and individual container of toxic material must be labeled with a warning as shown below:



It is particularly important to ensure that containers of poisonous liquids (i.e., industrial alcohol) are



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clearly identified and labeled to prevent human consumption, which can be fatal.

Miscellaneous Material

The categories of material in the following paragraphs require special storage and handling precautions:

Delicate Instruments

Delicate instruments, which usually are expensive and easily damaged, require especially careful handling and protective stowage. Delicate instruments will be kept in a dry atmosphere, away from magnetron tubes or other magnetic devices; and (when possible), the storeroom temperature should be 70° Fahrenheit or below.

Drummed Products

Whether on board drummed products are flammable liquids or non-flammable material, the drums will be stowed on end with the bung end up. An adequate identification of the contents will be legibly indicated on the side of each drum; and if stowed on the weather deck, they will be covered with a tarpaulin (when practicable). Drummed products will be inspected at least weekly to ensure that the bungs are tight and that there are no leaks or corrosion.

Electron Tubes

Electron tubes can easily be broken and therefore must be handled carefully and adequately packaged when being stowed or issued. Electron tubes susceptible to damage from moisture are normally packed in moisture-proof barriers, frequently with a desiccant or other dehydrating agent. Humidity indicator cards or plugs are provided for inspecting the effectiveness of the desiccant. Such indicators turn from blue to pink as moisture is absorbed; and when they become pink, the desiccant must be replaced. The cartons, cushioning, and other protective packing and packaging in which electron tubes were received will not be removed in stowage unless it is absolutely necessary because of space limitations. When an electron tube container must be reduced in size, positive identity of the tube and as much of the packaging as possible will be retained. When space is not a factor, the original pack and packaging of an electron tube will be opened only if

it is reasonably certain that the packaged tube is not the one identified by the part number on the container.

1. Radioactive electron tubes. Instructions for the stowage and handling of radioactive material, including radioactive electron tubes, are provided in paragraph 12.6.7.
2. Magnetrons. Magnetrons are diode vacuum tubes in which the flow of electrons is controlled by an externally applied magnetic field. Special precautions will be taken to prevent magnetrons, with permanently attached magnets, from damaging magnetically sensitive instruments (i.e., compasses [electronic or mechanical], and wristwatches - which should not be worn when handling magnetrons).

Metals

Bar stock, sheet metal, angle iron, tubing, pipe and other metals will be kept in racks specifically designed for the stowage of such metals. The racks should be installed fore-and-aft to minimize shifting of the stowed material when the vessel is underway. Polished sheet metal and aluminum tubing are easily scratched and dented, and therefore must be carefully handled and secured in the rack. Gloves should always be worn when handling metals to protect the hands from injury, and to protect certain metals with polished surfaces from acid stains, which can be caused by perspiration. When practicable, non-corrosive, grease-proof material will be used to separate dissimilar metals that are required to be stowed together, inasmuch as direct contact between different metals may cause corrosion due to electrolysis.

Since any required re-identification of metals by chemical analysis is usually impractical (or too costly), many metals that lose their identification markings are likely to become unusable. Positive identification of metals to be used in high pressure steam systems (or other critical shipboard systems) is absolutely necessary. Correct part numbers, specification markings, manufacturer's markings, or other identification must be legibly indicated on each piece of metal in stowage, and on each piece of metal removed from stowage for use.



Motors and Generators

Motors and generators will be stowed in their original containers (if available). If the original containers are not available, motors and generators will be protected from dust and humidity by enclosing them in a crate or plastic wrap, which includes an ample amount of desiccant; or (as a minimum), by coating their exposed shafts with grease and then wrapping the shafts with grease-proof paper.

Liquid Dielectric Capacitors

Most liquid dielectric capacitors (especially "pyranol" types) are supplied with a piece of fine bus wire, which is attached for the purpose of grounding the capacitor prior to its use in a de-energized or disconnected circuit. This wire must not become detached in stowage, nor will it be removed by anyone other than the technician (when the capacitor is ready for use).